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# THE AMERICAN NATURALIST

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## ON THE NESTING HABITS OF THE BROOK LAMPREY (*LAMPETRA WILDERI*).

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THE following notes on the nesting habits of the brook lamprey are not intended to cover completely this subject, but merely to amplify in a few details the observations of Gage<sup>1</sup> and Dean and Sumner.<sup>2</sup>

While at Ann Arbor, Mich., in the spring of 1899, we had the opportunity of observing several hundred brook lampreys nest building and spawning. They were in two small streams, about four miles west of Ann Arbor. The smaller was a tributary of the larger, and the latter emptied into the Huron River, a few miles from where my observations were made. From the mouth of this stream to Lake Erie the distance was about forty miles. We shall designate the smaller stream as A and the larger as B. Both streams flowed through meadow land. At points they were bordered by alders and willows.

<sup>1</sup> Gage, Simon Henry. Lake and Brook Lampreys of New York, *The Wilder Quarter Century Book*, 1893.

<sup>2</sup> Dean, Bashford, and Sumner, Francis B. Notes on the Spawning Habits of the Brook Lamprey (*Petromyzon wilderi*), *Trans. New York Acad. of Sci.*, vol. xvi. Dec. 9, 1897.

The stream bottom was mainly gravelly, but in many places sandy. The average width of stream B was ten feet, and of stream A three and one-half feet. Both had a moderately swift current.

Our observations were rather brief, covering only a portion of five days, from April 15 to April 20. Previous to April 15 there had been a succession of several warm days. On the 15th there was a decided fall of temperature. On the 17th another warm spell set in. On the 20th the temperature of the water at 4 P.M. was 63° F.

Gage is of the opinion that the males precede the females at spawning time and commence nest building before the arrival of the latter. This opinion is supported by the results obtained from a weir in the inlet of Cayuga Lake, N.Y., in the spring of 1898, which are recorded by Surface,<sup>1</sup> and also by our own observations. Following is a record of the number and sex of the fish taken by us during the period of observation.

APRIL.	TIME OF OBSERVATION.	♂	♀	♀ SPAWNED.
15	3-5 P.M.	1	—	—
17	3-5 P.M.	8 or 10 <sup>2</sup>	—	—
18	4-6.30 P.M.	44	11 <sup>3</sup>	—
19	5.30 A.M. to 6.30 P.M.	98	18	9
20	3-4.30 P.M.	52	14	4

The activity of the lampreys and their manner of nest building are shown by the following results, which are the average of sixteen nests observed.

TIME OF OBSERVATION.	NO. OF STONES MOVED.			
	Up Stream.	Down Stream.	Lateral.	No. of Fish.
4 $\frac{1}{4}$ minutes	4	2	1	2-3

<sup>1</sup> Surface, H. A., M.S. The Lampreys of Central New York, *Bulletin for National Fishery Congress, United States Fish Commission* (1897), pp. 145-371.

<sup>2</sup> Stream A only.

<sup>3</sup> Probably all gravid.

We do not think the lampreys have any definite method in the construction of their nests. When they seize a stone they usually endeavor to carry it straight ahead, without other instinct apparently than to remove it from the nest, no matter in what direction they may be heading. Often, however, they allow themselves to be carried down stream by the current, together with the stones which they have seized. A lamprey has been seen to carry a stone up stream a short distance and then allow itself to drift back again with it. In a few cases they have been observed to carry stones into the nest from without. They cling very persistently to whatever object they may have attached themselves, on one occasion a lamprey permitting itself to be lifted from the water attached to the boot of one of the writers. Contrary to the observation of Gage and Dean and Sumner, we have noted two lampreys move a stone conjointly. The largest stone moved (only an inch, however) by a single lamprey weighed thirty-three grams. In moving stones the lamprey arches its back and employs powerful brush-like movements of the tail against the stream bed, as in spawning. As noted by Dean and Sumner, one lamprey will frequently seize another and pull it away from its place of attachment. It is very interesting to watch them do this. One seizes another by the head and shakes it as a dog would a rat. In so doing they are usually carried out of the nest by the current, holding to each other for a short distance, when they separate and return to the nest.

The size of nests and depth of stream over them is expressed by the following data, which are the average for twenty-six nests.

DIAMETER    TO CURRENT.	DIAMETER ⊥ TO CURRENT.	DEPTH OF STREAM.
$7\frac{1}{2}$ inches	$7\frac{1}{8}$ inches	15 inches <sup>1</sup>

There is considerable variation both in the form and situation of the nests. The longer diameter may be either parallel or perpendicular to the current. They may be situated in any

<sup>1</sup> Average for twenty-five nests.

depth of water from six to twenty-four inches, near the bank or in the middle of the stream, under an overhanging bank or log, or in open water. The number of fish in a nest varies from one to thirty or forty (usually from three to twenty-five).

On the morning of the 19th the number of lampreys observed was much smaller than on the preceding afternoon. While there were no fish present in stream A on that morning, there had been quite a number there on the afternoon of the 18th. About noon of the 19th they became numerous again. We were on the spawning grounds till sunset on the 18th, and from sunrise on the 19th, and no marked migration of fish was observed at any time. For about two hours, however, before noon of the 19th we were exploring another stream, and there may have been a return of the fish to their spawning grounds at that time. Why the fish were less numerous on the morning of the 19th, or what became of them during the preceding night, it is difficult to conjecture. We have to thank Professor Jacob E. Reighard of Ann Arbor for numerous valuable suggestions and assistance in conducting our observations.

Through the kindness of the editor of the *American Naturalist* the following note from Professor Gage has been forwarded to the writers, and they take pleasure in appending it herewith :

As pointed out by Jordan and others who have made a special study of the American brook lamprey (*L. wilderi*), none have ever been found parasitic upon fishes, and none have ever been found in the waters of brooks except during the spawning season. To explain the apparent anomalies in the life history of the brook lamprey, Gage (*Proc. Amer. Assoc. Adv. Sci.* [1898], p. 372, and [1899] p. 256) carried on observations in laboratory aquaria for four years and made field observations upon the same subject during the entire year. It was found that the brook lamprey : (1) never goes to the larger waters of the lake, but remains constantly in the brooks ; (2) it attains its full size during the larval state ; (3) it is never parasitic, although a special œsophagus is developed as in parasitic forms (sea and lake lamprey), and the lingual and buccal teeth are fairly well developed ; (4) during the transformation period the animal remains under the sand like a larva (from September till April), during which time the eggs and zoöspers ripen ; (5) when the spawning season arrives (April-May) they emerge from the sand, build their nests, spawn, and disappear.